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Onset of Fast Reconnection in Laboratory and Space Plasmas A. BHATTACHARJEE, K. GERMASCHEWSKI, YI-MIN HUANG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire, H. YANG, B. ROGERS, Center for Integrated Computation and Analysis of Reconnection and Turbulence, Dartmouth College — The onset of fast reconnection is widely studied in laboratory plasmas, satellite measurements in the Earth's magnetosphere, and solar flares. Using high- performance computing tools, based on Hall MHD equations, we will show that important features of such dynamics can be accounted for in one unifying framework. The model also elucidates the role of diamagnetic drifts that can quench nonlinearly the onset of fast reconnection. The problem takes on additional complexity when it is applied to large systems of high Lundquist number. It is shown that the dynamics of thin current sheets in such systems shows qualitative similarities in the collisional and collisionless regimes. In the resistive MHD model, at high-Lundquist number, the thin current sheet becomes near-explosively unstable to secondary tearing, producing plasmoids copiously. The linear instability for an entire class of such super-Alfvenic instabilities can be deduced from the classical tearing mode dispersion relation. In the nonlinear stage, one attains a new regime of fast reconnection in which the reconnection rate exceeds by far the predictions of Sweet-Parker theory, and becomes weakly dependent on the Lundquist number.

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